

## Abstract

In the current work, a novel, experimental 'bottom-up' approach is used to quantify the economic value of ecosystem services (ES) associated with highly modified arable landscapes in Canterbury, New Zealand. First, the role of land management practices in the maintenance and enhancement of ES in agricultural land was investigated by quantifying the economic value of ES at the field level under organic and conventional arable systems. This quantification was based on an experimental approach in contrast with earlier value transfer methods. Total economic value of ES in organic fields ranged from US \$1610 to US \$19,420 ha<sup>-1</sup> yr<sup>-1</sup> and that of conventional fields from US \$1270 to US \$14,570 ha<sup>-1</sup> yr<sup>-1</sup>. The non-market value of ES in organic fields ranged from US \$460 to US \$5240 ha<sup>-1</sup> yr<sup>-1</sup>. The range of non-market values of ES in conventional fields was US \$50 — 1240 ha<sup>-1</sup> yr<sup>-1</sup>. There were significant differences between organic and conventional fields for the economic values of some ES. Next, this economic information was used to extrapolate and to calculate the total and non-market value of ES in Canterbury arable land. The total annual economic and non-market values of ES for the conventional arable area in Canterbury (125,000 ha) were US \$332 million and US \$71 million, respectively. If half the arable area under conventional farming shifted to organic practices, the total economic value of ES would be US \$192 million and US \$166 million annually for organic and conventional arable area, respectively. In this case, the non-market value of ES for the organic area was US \$65 million and that of conventional area was US \$35 million annually. This study demonstrated that arable farming provides a range of ES which can be measured using field experiments based on ecological principles by incorporating a 'bottom-up' approach. The work also showed that conventional New Zealand arable farming practices can severely reduce the financial contribution of some of these services in agriculture whereas organic agricultural practices enhance their economic value.

## Keywords

Arable land; Avoided cost; Economic value; Ecosystem services; Engineered ecosystems; Organic